SEMICONDUCTOR SUBSTRATE MANUFACTURING METHOD AND APPARATUS THEREOF

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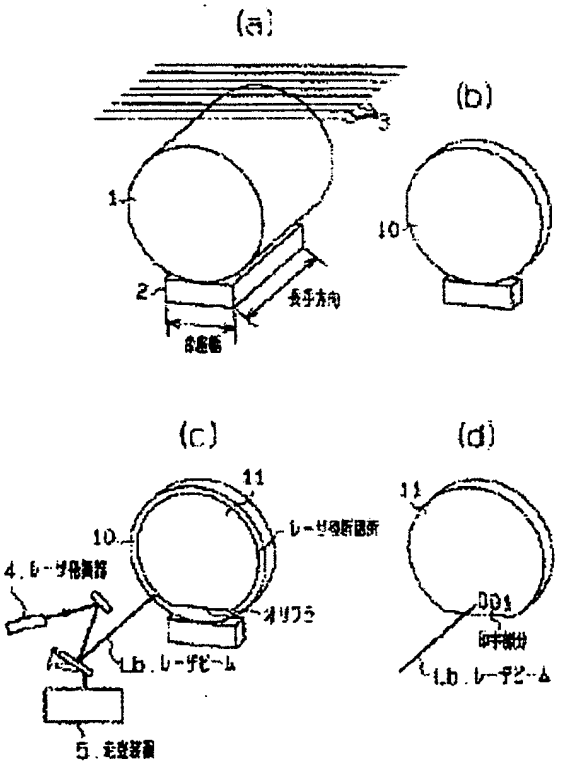
Abstract of **JP2004039808**

<P>PROBLEM TO BE SOLVED: To easily manufacture a semiconductor substrate into a novel structure with a desired shape and size. <P>SOLUTION: A cylindrical ingot 1 is sliced in a prescribed thickness and formed into disc-like wafers 10. A laser beam Lb is irradiated on the disc-like wafer 10 to cut the wafer 10 into a wafer 11 of a desired shape and size. <P>COPYRIGHT: (C) 2004,JPO



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]
The slice process which slices a cylinder-like ingot (1) in predetermined thickness, and is used as a disc-like semi-conductor substrate (10),
The **** process which cuts down the configuration of arbitration, and the semi-conductor substrate (11) of a dimension from the semi-conductor substrate (10) concerned by cutting by the exposure of the laser beam (Lb) to said disc-like semi-conductor substrate (10),
The manufacture approach of the semi-conductor substrate characterized by ****(ing).
[Claim 2]
Cutting by the exposure of the laser beam (Lb) to the disc-like semi-conductor substrate (10) in said **** process is the manufacture approach of the semi-conductor substrate according to claim 1 characterized by carrying out where said disc-like semi-conductor substrate (10) is stuck on adhesive tape (41).
[Claim 3]
Said slice process is in the condition which supported the ingot (1) by the susceptor seat (2), and is performed by slicing said susceptor seat (2) with an ingot (1) with a wire saw (3) or a blade,
Said **** process is the manufacture approach of the semi-conductor substrate according to claim 1 or 2 characterized by deciding the location and sense which cut down the configuration of arbitration, and the semi-conductor substrate (11) of a dimension from the semi-conductor substrate (10) sliced on the basis of said susceptor seat (2).
[Claim 4]
The location started by cutting by said laser beam (Lb) in said **** process While measuring and deciding the distance to the edge of the semi-conductor substrate (10) of a susceptor seat (2) and the opposite side from the core of said susceptor seat (2), and the rear face of a susceptor seat (2) The sense to start is the manufacture approach of the semi-conductor substrate according to claim 3 characterized by making it decide on the basis of the sense of the rear face of a susceptor seat (2).
[Claim 5]
Said slice process is performed by slicing with a wire saw (3) or a blade, after attaching the mark (30 31) prolonged in a longitudinal direction in the peripheral face of a cylinder-like ingot (1),
Said **** process is the manufacture approach of the semi-conductor substrate according to claim 1 or 2 characterized by deciding the location and sense which cut down the configuration of arbitration, and the semi-conductor substrate (11) of a dimension from the semi-conductor substrate (10) sliced on the basis of said mark (30 31).
[Claim 6]
The manufacture approach of the semi-conductor substrate according to claim 1 or 2 characterized by making it print on the front face of the semi-conductor substrate (10 11) concerned by the exposure of the laser beam (Lb) to a semi-conductor substrate (10 11) before cutting by the laser beam (Lb) in said **** process, or in after cutting.
[Claim 7]
Printing by said laser beam (Lb) is the manufacture approach of the semi-conductor substrate according to claim 6 characterized by making an alphabetic character recognize by carrying out induction of the defect to a semi-conductor substrate (10 11), and changing the rate of optical refraction, or a reflection factor into it.
[Claim 8]
The location and sense which be print by said laser beam (Lb) be the manufacture approach of the susceptor seat (2) used in order to support an ingot (1) at said slice process, or the semi-conductor substrate according to claim 6 or 7 characterize by make it decide on the basis of the mark (30 31) attached so that it might extend in a longitudinal direction in the peripheral face of an ingot (1) before slice.
[Claim 9]
The location printed by said laser beam (Lb) While measuring and deciding the distance to the edge of the semi-conductor substrate (10) of a susceptor seat (2) and the opposite side from the core of the susceptor seat (2) used in order to support an ingot (1) at said slice process, and the rear face of a susceptor seat (2) The sense to print is the manufacture approach of the semi-conductor substrate according to claim 6 or 7 characterized by making it decide on the basis of the sense of the rear face of a susceptor seat (2).
[Claim 10]
The manufacture approach of a semi-conductor substrate given in any 1 term of claims 1-9 characterized by cutting down two or more semi-conductor substrates (12) by cutting by the laser beam (Lb) from said one sliced semi-conductor substrate (10) in said **** process.
[Claim 11]
The manufacture approach of a semi-conductor substrate given in any 1 term of claims 1-9 characterized by cutting down two or more semi-conductor substrates (13a, 13b, 13c, 13d) of the configuration of arbitration, and a dimension by cutting by the laser beam (Lb) from said one sliced semi-conductor substrate (10) in said **** process.
[Claim 12]

Said ingot (1) is the manufacture approach of a semi-conductor substrate given in any 1 term of claims 1-11 characterized by consisting of silicon or silicon carbide.

[Claim 13]

The laser oscillation machine for irradiating the semi-conductor substrate (10) which outputted the laser beam (Lb) and sliced this laser beam (Lb) from the ingot (1) (4),

The scan means for scanning said laser beam (Lb) to said semi-conductor substrate (10), and cutting down the configuration of arbitration, and the semi-conductor substrate (11) of a dimension by cutting by the laser beam (Lb) (5),

The manufacturing installation of the semi-conductor substrate characterized by preparation ******.

[Claim 14]

The frame which has bigger opening (40a) than said sliced semi-conductor substrate (10) (40),

Adhesive tape with which it is stuck on said frame (40), and the semi-conductor substrate (10) sliced from the ingot (1) in opening (40a) of a frame (40) is stuck (41),

The table for cutting for fixing the semi-conductor substrate (10) stuck on adhesive tape (41) in opening (40a) of said frame (40), irradiating a laser beam (Lb) and cutting it to a semi-conductor substrate (10), in this condition, (20),

The manufacturing installation of the semi-conductor substrate according to claim 13 characterized by preparation ******.

[Claim 15]

The manufacturing installation of the semi-conductor substrate according to claim 13 or 14 characterized by using the adsorption method by the vacuum as a means to fix said sliced semi-conductor substrate (10) to the table for cutting (20).

[Claim 16]

The manufacturing installation of the semi-conductor substrate according to claim 14 or 15 characterized by using the adsorption method by the vacuum as a means to fix said frame (40) to the table for cutting (20).

[Claim 17]

The manufacturing installation of the semi-conductor substrate according to claim 14 or 15 characterized by using the member (50) suppressed on the table for cutting (20) from on a frame (40) as a means to fix said frame (40) to the table for cutting (20).

[Claim 18]

The manufacturing installation of the semi-conductor substrate according to claim 14 or 15 characterized by using the magnet (51) which adsorbs a frame (40) as a means to fix said frame (40) to the table for cutting (20).

[Claim 19]

Said frame (40) is the manufacturing installation of the semi-conductor substrate according to claim 18 characterized by consisting of an ingredient by which a magnet is adsorbed.

[Claim 20]

A table (20) for a laser beam (Lb) to cut said sliced semi-conductor substrate (10) is the manufacturing installation of a semi-conductor substrate given in any 1 term of claims 13-19 characterized by forming the crevice (22) in the field to which the semi-conductor substrate (10) concerned is cut in the field (20a) in which the sliced semi-conductor substrate (10) is installed.

[Claim 21]

A table (20) for a laser beam (Lb) to cut said sliced semi-conductor substrate (10) is the manufacturing installation of a semi-conductor substrate given in any 1 term of claims 13-19 characterized by being the structure which supports the field where a semi-conductor substrate (10) is cut at least by the line.

[Claim 22]

Said table (20) is the manufacturing installation of the semi-conductor substrate according to claim 21 characterized by consisting of honeycomb material (24).

[Claim 23]

Said honeycomb material (24) is the manufacturing installation of aluminum, copper, stainless steel, and the semi-conductor substrate according to claim 22 characterized by being the thing of a ceramic which consists of either at least.

[Claim 24]

A table (20) for a laser beam (Lb) to cut said sliced semi-conductor substrate (10) is the manufacturing installation of a semi-conductor substrate given in any 1 term of claims 13-19 characterized by being the structure which supports at a point the field where a semi-conductor substrate (10) is cut at least.

[Claim 25]

Said table (20) is the manufacturing installation of the semi-conductor substrate according to claim 24 characterized by being the structure which set up many thin columns (25).

[Claim 26]

Said thin column (25) is the manufacturing installation of aluminum, copper, stainless steel, and the semi-conductor substrate according to claim 25 characterized by being the thing of a ceramic which consists of either at least.

[Claim 27]

Said ingot (1) is the manufacture approach of a semi-conductor substrate given in any 1 term of claims 13-26 characterized by consisting of silicon or silicon carbide.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the manufacture approach of a semi-conductor substrate, and equipment.
[0002]
[Description of the Prior Art]
In the production process of a silicon wafer, the process which slices a semi-conductor substrate (wafer) from an ingot is performed by a blade or a wire saw with a peripheral cutting edge and an inner circumference cutting edge. While carrying out cylindrical grinding of the peripheral face of an ingot before this slice process and making it a desired diameter, the cage hula or notch for clarifying crystal orientation is formed with surface grinding. Thereby, the semi-conductor substrate with which the cage hula or the notch was formed for the desired diameter is cut down at a slice process.
[0003]
Here, since it is an overly hard ingredient compared with silicon in the case of silicon carbide, the cylindrical grinding of an ingot peripheral face and surface grinding of cage hula formation take great floor to floor time. The field started to the longitudinal direction of an ingot, so that an ingot moreover becomes a long picture with the diameter of macrostomia especially is not perpendicular, and when it gives an include angle (off angle), floor to floor time increases further. Moreover, there is a problem that it becomes quick short grinding stones' decreasing in number a life, and processing cost becomes high.
[0004]
Moreover, when manufacturing the wafer of small aperture from the ingot of the diameter of macrostomia, there is a problem that the part which the part which it fails to delete increases and floor to floor time not only becomes long, but makes useless increases.
[0005]
[Problem(s) to be Solved by the Invention]
This invention is made under such a background and the purpose is in enabling it to manufacture easily the configuration of arbitration, and the semi-conductor substrate of a dimension with a new configuration.
[0006]
[Means for Solving the Problem]
As the manufacture approach of a semi-conductor substrate, the configuration of arbitration and the semi-conductor substrate of a dimension are cut down from the semi-conductor substrate concerned by cutting by the exposure of a laser beam [as opposed to / in / like, slice a cylinder-like ingot in predetermined thickness, make it a disc-like semi-conductor substrate in a slice process, and / an after that and **** process / a disc-like semi-conductor substrate] according to claim 1. Thereby, the configuration of arbitration and the semi-conductor substrate of a dimension can be manufactured easily.
[0007]
Here, if it is made to perform cutting by the exposure of the laser beam to a disc-like semi-conductor substrate [in / like / a **** process] according to claim 2 where a disc-like semi-conductor substrate is stuck on adhesive tape, it can prevent the chip and crack by the impact at the time of cutting.
[0008]
Moreover, a slice process is in the condition according to claim 3 which supported the ingot by the susceptor seat, and it carries out by slicing susceptor seat with an ingot with a wire saw or a blade, and it is [like] good [a **** process] to decide the location and sense which cut down the configuration of arbitration, and the semi-conductor substrate of a dimension from the semi-conductor substrate sliced on the basis of the susceptor seat. While the location started by cutting according to claim 4 according [in / like / a **** process] to a laser beam measures and determines the distance to the edge of the semi-conductor substrate of a susceptor seat and the opposite side from the core of a susceptor seat, and the rear face of a susceptor seat in detail, the sense to start is good to make it decide on the basis of the sense of the rear face of a susceptor seat.
[0009]
Or after attaching the mark according to claim 5 to which a slice process extends in a longitudinal direction in the peripheral face of a cylinder like ingot like, it carries out by slicing with a wire saw or a blade, and a **** process is good to decide the location and sense which cut down the configuration of arbitration, and the semi-conductor substrate of a dimension from the semi-conductor substrate sliced on the basis of the mark.
[0010]
Moreover, before cutting according to claim 6 according to the laser beam in a **** process like, or in after cutting, it is also printable on the front face of the semi-conductor substrate concerned with the exposure of the laser beam to a semi-conductor substrate. Under the present circumstances, printing according to claim 7 according to a laser beam like is good to make an alphabetic character recognize by carrying out

induction of the defect to a semi-conductor substrate, and changing the rate of optical refraction, or a reflection factor into it. Moreover, the location and sense according to claim 8 which are printed by the laser beam like are good to make it decide on the basis of the susceptor seat used in order to support an ingot at a slice process, or the mark attached so that it might extend in a longitudinal direction in the peripheral face of an ingot before slicing. In detail, while measuring and deciding the distance to the edge of the semi-conductor substrate of a susceptor seat and the opposite side from the core of the susceptor seat used in order that the location according to claim 9 printed by the laser beam might support an ingot at a slice process like, and the rear face of a susceptor seat, the sense to print is good to make it decide on the basis of the sense of the rear face of a susceptor seat.

[0011]

On the other hand, from the semi-conductor substrate of one sheet sliced in the **** process like according to claim 10, two or more semi-conductor substrates are cut down by cutting by the laser beam, or two or more semi-conductor substrates of the configuration of arbitration and a dimension can be cut down by cutting by the laser beam from the semi-conductor substrate of one sheet sliced in the **** process like according to claim 11.

[0012]

Moreover, the thing according to claim 12 which consists of silicon or silicon carbide can be used for an ingot like.

A semi-conductor substrate carries out a manufacturing installation, the laser beam to the laser oscillation machine and semi-conductor substrate for irradiating the semi-conductor substrate according to claim 13 which outputted the laser beam like and sliced this laser beam from the ingot is scanned, and the thing equipped with the scan means for cutting down the configuration of arbitration and the semi-conductor substrate of a dimension by cutting by the laser beam is used. This will become desirable as equipment which embodies the manufacture approach of a semi-conductor substrate according to claim 1.

[0013]

The frame which has opening bigger here than the semi-conductor substrate according to claim 14 sliced like, the adhesive tape with which the semi-conductor substrate which it was stuck on the frame and sliced from the ingot in opening of a frame is stuck, and the semi-conductor substrate stuck on adhesive tape in opening of a frame are fixed, and the thing equipped with the table for cutting for irradiating a laser beam and cutting it to a semi-conductor substrate, in this condition, is used. This will become desirable as equipment which embodies the manufacture approach of a semi-conductor substrate according to claim 2.

[0014]

Moreover, it is good to use the adsorption method by the vacuum as a means to fix to the table for cutting the semi-conductor substrate according to claim 15 sliced like.

Furthermore, as a means to fix a frame to the table for cutting, the adsorption method according to claim 16 according to a vacuum like can be used, the member according to claim 17 suppressed on the table for cutting from on a frame can be used like, or the magnet according to claim 18 which adsorbs a frame can be used like. Here, when using the magnet which adsorbs a frame, a frame shall consist of an ingredient according to claim 19 by which a magnet is adsorbed like.

[0015]

Moreover, a table for a laser beam to cut the sliced semi-conductor substrate Like the publication [**** / that the crevice is formed in the field to which a semi-conductor substrate is cut in the field in which the semi-conductor substrate according to claim 20 sliced like is installed] to claim 21 It is the structure which supports the field where a semi-conductor substrate is cut at least by the line. Like a publication to claim 22 especially this table It consists of honeycomb material and honeycomb material is good for claim 23 like a publication in it being the thing of aluminum, copper, stainless steel, and a ceramic which consists of either at least.

[0016]

Or a table for a laser beam to cut the sliced semi-conductor substrate is structure which supports at a point the field according to claim 24 where a semi-conductor substrate is cut at least like, this table is the structure according to claim 25 which set up many thin columns like, and a thin column is good for claim 26 like a publication in it being the thing of aluminum, copper, stainless steel, and a ceramic which consists of either at least.

[0017]

An ingot is [like] good to use the thing according to claim 27 which consists of silicon or silicon carbide.

[0018]

[Embodiment of the Invention]

(Gestalt of the 1st operation)

Hereafter, the gestalt of the 1st operation which materialized this invention is explained according to a drawing.

[0019]

Drawing 1 (a) The fundamental processing procedure of the gestalt of this operation is shown in - (d).

As shown in drawing 1 (a), the ingot 1 which consists of silicon or silicon carbide is prepared. And the cylinder-like ingot 1 is stuck on the susceptor seat 2, and an ingot 1 is sliced in predetermined thickness by the wire saw 3 in this condition, and as shown in drawing 1 (b), it is made the disc-like wafer (semi-conductor substrate) 10. In this slice process, where an ingot 1 is supported by the susceptor seat 2, the susceptor seat 2 is also sliced with an ingot 1 by the wire saw 3 (or blade).

[0020]

Thus, to the sliced wafer 10, as shown in drawing 1 (c) and (d), the configuration of arbitration and the wafer (semi-conductor substrate) 11 of dimension are cut down from a wafer 10 by cutting by the exposure of a laser beam Lb. That is, while making it a desired diameter as cutting processing by the exposure of the laser beam Lb to the disc-like wafer 10 as shown in drawing 1 (d) as shown in drawing 1 (c), the cage hula or notch for recognizing crystal orientation is formed. Thereby, the configuration of arbitration and the wafer (semi-conductor substrate) 11 of a dimension can be manufactured easily.

[0021]

Furthermore, as shown in drawing 1 (d), an identification number is printed by the laser beam Lb near the cage hula etc. after cutting (or before cutting). Printing by the laser beam Lb makes an alphabetic character recognize by carrying out induction of the defect to a wafer (10 11), and

changing the rate of optical refraction, or a reflection factor into it by the exposure of a laser beam Lb. Since printing is possible in the flat condition by this, without forming a crevice in a substrate front face, compared with the case where carry out melting (sublimation) of the substrate front face, and it prints in a crevice, the chip of a crevice or the residue in a crevice can abolish particle generating of a reason. This approach is effective when it is an ingredient with a transparent substrate.

[0022]

In drawing 1 (c), a laser beam Lb is outputted from the laser oscillation machine 4, and is scanned by the scanner 5 as a scan means. Here, the quality of the material of a wafer, thickness, etc. adjust the output of a laser beam Lb at a cutting process and a printing process, respectively. Moreover, by using the wavelength and the laser oscillation machine of an output which can cut silicon or silicon carbide and can be printed to silicon or silicon carbide, at high speed, a configuration is good and can perform quality processing.

[0023]

Thus, the same equipment performs the process which cuts a desired appearance and the wafer 11 of a dimension, and the process which prints the alphabetic character for discernment at the same process to the wafer 10 sliced from the ingot 1. It is not necessary to make it the diameter of a request of the peripheral face of an ingot 1 with cylindrical grinding, and to carry out surface grinding before the slice shown in drawing 1 (a), for cage hula formation at this time. However, in order to stick the susceptor seat 2 on an ingot 1 firmly, processing which prepares the form of the peripheral face of an ingot 1 by grinding etc. may be performed.

[0024]

Although it had become a heavy load and high cost in the conventional technique depending on the degree of hardness of an ingredient in order to process cylindrical grinding, surface grinding, etc. before a slice when reference was furthermore made, processing with the sufficient effectiveness which is not related to the ingredient degree of hardness after a slice in this operation gestalt can perform appearance processing of a semi-conductor substrate. Moreover, with appearance processing, this equipment can perform processing which prints a number etc. to the semi-conductor substrate which was being performed with another process and another equipment to appearance processing and coincidence. Furthermore, when manufacturing the semi-conductor substrate of small aperture from the diameter ingot of macrostomia, it can be processed that it is efficient and there is no futility. Thus, after a slice, by processing which is not related to an ingredient degree of hardness, efficiently, versatility is high, and is low cost and, moreover, an ingot can be utilized effectively.

[0025]

If the peripheral face of the ingot manufactured at the crystal growth process when explanation was furthermore added is sliced without carrying out cylindrical grinding and surface grinding, the semi-conductor substrate with which an appearance differs from a diameter also within an ingot again will be cut down for every ingot. An appearance will be in the condition that the cage hula which shows crystal orientation is not formed, either instead of a fixed configuration (perfect circle configuration). On the other hand, with this operation gestalt, while making a semi-conductor substrate into the perfect circle configuration of the diameter of fixed, before slicing processing which forms a cage hula, it does not carry out by mechanical processing like grinding and cutting, but melting (sublimation) is carried out by the laser beam Lb after a slice, and it cuts. If it melts and cuts by the laser beam Lb (making it sublimate in the case of silicon carbide), the degree of hardness of an ingredient is not related. Moreover, since it can cut at a high speed if it is in the thin wafer condition after a slice, processing is possible for a short time. Furthermore, there are also few damages by processing. The process which has processed it separately with cylindrical grinding and surface grinding before a slice is processing hollowed by the laser beam Lb after a slice conventionally, and the circular section and a bay (cage hula section) are made at the same process. Furthermore, the same equipment can also perform the marking process which prints an identification number etc. to the wafer which was being performed with another equipment by another process until now to cutting and coincidence by adjusting the output of a laser beam. Namely, although it prints with a dedicated device to a substrate after completion in the middle of manufacture of a semi-conductor substrate in order to identify the batch number of the manufactured semi-conductor substrate etc. (marking) By printing to a semi-conductor substrate (10 11) by the laser beam Lb before cutting by the laser beam Lb of the semi-conductor substrate 10 sliced from the ingot 1, or after cutting The dedicated device for printing is not needed but printing is possible at the same process as cutting by the laser beam Lb with the same equipment.

[0026]

You may make it it not only to cut down one wafer 11, but cut down two or more wafers (semi-conductor substrate) 12 from one sliced wafer 10 by cutting by the laser beam Lb here to the wafer 10 sliced from the ingot 1, as shown in drawing 2 (b) as shown in drawing 2 (a). that is, more than the twice of the diameter of a wafer which the diameter of an ingot manufactures -- in a certain case, two or more wafers 12 can be cut down from one sliced wafer 10 (printing can also be carried out). Thus, you may make it cut down two or more wafers 12 of the same configuration.

[0027]

Or you may make it cut down two or more wafers (semi-conductor substrate) 13a, 13b, 13c, and 13d of the configuration of arbitration, and a dimension by cutting by the laser beam Lb from one sliced wafer 10, as shown in drawing 2 (c). That is, it is also possible to cut down two or more wafers with which diameters differ, it can respond not only to a round shape but to arbitration configurations, such as a polygon, and further, when defect fields, such as a crystal defect, are in a part, the field can be removed and a wafer can also be cut down. Thus, two or more wafers 13a, 13b, 13c, and 13d of a different configuration and a dimension are cut down (printing is also carried out), and it is good even if like.

[0028]

Moreover, it is not necessary to remove after a slice the susceptor seat 2 attached since an ingot 1 was fixed at the slice process in drawing 1 (a) and (b). That is, as shown in drawing 3 (a), in case the sliced wafer 10 is set in equipment (table) 20, the location cut on the basis of a plinth 2 and the sense of a cage hula can be decided. However, drawing 3 (a) is the case that the width of face of a plinth 2 is larger than the diameter of an ingot 1. The plinth 2 of drawing 1 (a) is a rectangular parallelepiped configuration, forms in a fixed side the crevice doubled with the configuration of an ingot 1, and supports it. While fixing as physical relationship in the case of immobilization of the ingot 1 to this plinth 2 so that the lead in the direction of a path of an ingot 1 may be taken as the core of the cross direction of a plinth 2 shows drawing 3 (a), it fixes so that the sense which forms a cage hula, and the sense of the rear face of a plinth 2 may become parallel. When making the edge (right end section in drawing 3 (a)) of a plinth 2 into the zero of equipment and cutting a wafer 10 by this, the location based on [used as criteria] wafers

and the sense of a wafer can be decided. concrete -- the wafer core (Xc) of the direction of X -- the central point of the cross direction of a plinth 2 -- that is,
Xc= (width of face of plinth)/2
It comes out. Moreover, the wafer core (Yc) of the direction of Y measures the distance (wafer height) from the rear face of a plinth 2 to the edge of a plinth 2 and the semi-conductor substrate 10 of the opposite side,
Height [of the Yc= plinth 2] + {(height of a measured-value-plinth) /2}
It asks from ********. Moreover, the sense of a cage hula becomes the sense of the rear face of a plinth 2, and parallel.
[0029]
Thus, wafer height is measured and a wafer core is decided, after pressing the end of a plinth 2 against the criteria location used as the zero of equipment 20 and fixing to equipment 20 (table), when the width of face of a plinth 2 is larger than the diameter of an ingot as shown in drawing 3 (a).
[0030]
That is, a **** process determines the location and sense which cut down the configuration of arbitration, and the semi-conductor substrate 11 of a dimension from the semi-conductor substrate 10 sliced on the basis of the susceptor seat 2. While the location started by cutting by the laser beam Lb in a **** process measures and determines the distance to the edge of the semi-conductor substrate 10 of the susceptor seat 2 and the opposite side in detail from the core of the susceptor seat 2, and the rear face of the susceptor seat 2, the sense to start is decided on the basis of the sense of the rear face of the susceptor seat 2. Moreover, before cutting by the laser beam Lb in a **** process, or in after cutting, it prints on the front face of the semi-conductor substrates 10 and 11 by the exposure of the laser beam Lb to the semi-conductor substrates 10 and 11.
[0031]
In addition, what is necessary is just to decide a wafer core through block 6 in this case, although a plinth 2 cannot be pressed against the criteria location used as a zero when the width of face of a plinth 2 is smaller than the diameter of an ingot as shown in drawing 3 (b). That is, the core (Xc, Yc) of a wafer measures the distance (wafer height) from the rear face of a plinth 2 to the edge of a plinth 2 and the semi-conductor substrate 10 of the opposite side,
Die-length [of the Xc= block 6] + (width of face of plinth)/2
Height [of the Yc= plinth 2] + {(height of a measured-value-plinth) /2}
since -- it asks.
[0032]
Next, how to decide a wafer core and the cage hula sense on the basis of the marks 30 and 31 attached to the ingot 1 is explained using drawing 4 (a) and (b).
As shown in drawing 4 (a), before a slice, the crystal orientation of an ingot 1 is measured, marking is performed to the peripheral face of an ingot 1, and lines (mark) 30 and 31 are attached. That is, ****** with entry according at least two lines to an oily pen etc. or a diamond pen is performed so that the peripheral face of an ingot may understand crystal orientation. A direction parallel to the line L1 which connected by the two points which carried out marking on the front face of the wafer 10 after a slice like drawing 4 (b) becomes the cage hula sense. Moreover, if a wafer core is perpendicular to the line L1 which connected two points which carried out marking on the front face of a wafer 10 and the line L2 passing through the middle point 32 is used as a vertical center line, the core of the distance between wafer edges on a vertical center line L2 will take the wafer lead.
[0033]
That is, a slice process is performed by slicing with a wire saw 3 or a blade, after attaching the marks 30 and 31 prolonged in a longitudinal direction in the peripheral face of the cylinder-like ingot 1, and a **** process is good to decide the location and sense which cut down the configuration of arbitration, and the semi-conductor substrate 11 of a dimension from the semi-conductor substrate 10 sliced on the basis of marks 30 and 31.
[0034]
Thus, where support immobilization of the wafer 10 is carried out at equipment (table) 20, a wafer core is decided, and a laser beam Lb is scanned and cut on the basis of this. Although a laser beam Lb has the desirable CO2 laser from which a big output is obtained, as long as it is a thin ingredient, an YAG laser is sufficient as it.
[0035]
Moreover, when printing by the laser beam Lb, the location and sense of the printing are good to make it decide on the basis of the susceptor seat 2 used in order to support an ingot 1 at a slice process, or the marks 30 and 31 which were attached so that it might extend in a longitudinal direction in the peripheral face of an ingot 1 before slicing. That is, while measuring and deciding the distance to the edge of the semi-conductor substrate 10 of the susceptor seat 2 and the opposite side from the core of the susceptor seat 2 used in order that the location printed by the laser beam Lb might support an ingot 1 at a slice process, and the rear face of the susceptor seat 2, the sense to print is good to make it decide on the basis of the sense of the rear face of the susceptor seat 2.
[0036]
Before cutting by the laser beam, evaluate the condition of a wafer and the field to cut and the direction of a cage hula are not decided for every sheet. If the plinth pasted up in order to support an ingot like old explanation, when slicing by approaches, such as a wire saw, is used or the mark is put on an ingot before a slice A wire saw or a blade can perform a slice and the location and sense which are started by cutting by the laser beam Lb of the semi-conductor substrate 10 sliced on the basis of the susceptor seat 2 or marks 30 and 31 can be decided. When for that the physical relationship of an ingot 1 and the susceptor seat 2 and the relation between the crystal orientation of an ingot 1 and the rear face of the susceptor seat 2 have been grasped, the susceptor seat 2 is pasted up on an ingot 1.
[0037]
The structure of the table 20 for cutting is shown in drawing 5 . On the table which adsorbs the whole surface of a wafer 10, the exposure section (cutting section of a wafer 10) melts, and a laser beam Lb becomes irregularity in order to penetrate a wafer 10. Therefore, can repeat . table and it cannot be used. Then, the structure of the table 20 for cutting of this example is as follows.

[0038]
In wafer back-face 20a of a table 20, the hole 21 for vacuum chucks is formed in the part equivalent to the center section of a wafer 10, and it is made to carry out the vacuum chuck of the wafer 10 in opening of this hole 21. Moreover, the crevice 22 is formed in the field (cutting field) to which a laser beam Lb is irradiated in wafer back-face 20a of a table 20. That is, the table 20 for a laser beam Lb to cut the sliced semi-conductor substrate 10 can be repeatedly used, if the crevice 22 shall be formed in the field to which the semi-conductor substrate 10 is cut in field 20a in which the sliced semi-conductor substrate 10 is installed.
[0039]
Or as shown in drawing 6 , while forming the hole 21 for vacuum chucks in the part equivalent to the center section of a wafer 10 in wafer back-face 20a of a table 20, it is made the structure where the cutting field by the laser beam Lb becomes the outside of a table 20.
[0040]
However, with this structure, the cut periphery field is bent by self-weight, it becomes easy to break, and a chip may occur in a cutting plane with this impact in it. A wafer breaks depending on the case.
[0041]
It is good to make it the table structure from which the table 23 which supports the wafer periphery section was added, and the cutting field (laser beam exposure section) became the surroundings of the table 20 of drawing 6 in the opening as shown in drawing 7 in consideration of this.
[0042]
Moreover, you may make it the structure which constitutes the table 20 for cutting from honeycomb material 24 as shown in drawing 8 , and supports a cutting field by the line. That is, the table 20 for a laser beam Lb to cut the sliced semi-conductor substrate 10 can control degradation of a table as it is the structure which supports the field where the semi-conductor substrate 10 is cut at least by the line.
[0043]
Or as shown in drawing 9 , many pins (thin column) 25 may be set up to the field to which a wafer 10 is cut at least, and you may make it the structure which supports the cutting field of a wafer 10 at a point. By this, since most fields where a laser beam Lb is irradiated become an opening, it can respond to the configuration of arbitration, and wafer cutting of a dimension, and degradation of a table can be controlled. The quality of the material of the honeycomb structure object 24 of drawing 8 or the pin 25 of drawing 9 has good metal or ceramics, such as aluminum, copper, and stainless steel. That is, the honeycomb material 24 and a pin 25 are good to consider as the thing of aluminum, copper, stainless steel, and a ceramic which consists of either at least.
(Gestalt of the 2nd operation)
Next, it explains focusing on difference with the gestalt of the 1st operation of the gestalt of the 2nd operation.
[0044]
With the gestalt of the 1st operation, although the center section of a wafer 10 is adsorbed by the vacuum chuck, the wafer periphery section cu is not adsorbed. In this case, although cutting will become quick if the output of a laser beam Lb is enlarged, the impact at the time of processing may also become large, and it may fly [the cut periphery section may be missing and]. A crack not only occurs, but at this time, a wafer 10 may be broken into the cutting section depending on the case.
[0045]
This cure is taken with this operation gestalt.
As shown in drawing 10 (a), the processing guide 40 and adhesive tape 41 as a frame are used. As for adhesive tape 41, the binder is applied to one [at least] field. The processing guide (frame) 40 is larger than the wafer 10 which nothing, among those opening 40a in the direction sliced about annular. All over one field of the processing guide 40, adhesive tape 41 is stuck and the wafer 10 sliced on the tape 41 in opening 40a of the processing guide 40 is stuck. And the wafer 10 stuck on adhesive tape 41 in opening 40a of the processing guide 40 is fixed to the table for cutting, and in this condition, to a wafer 10, a laser beam Lb is irradiated and is cut.
[0046]
Thus, as by cutting where a wafer 10 is stuck on adhesive tape 41 shows to drawing 1010 (b), while being able to prevent generating of the crack by the impact at the time of cutting, since the wafer periphery section is pasted up on adhesive tape 41, the wafer periphery section does not fly with the impact of cutting (a chip can be prevented). Consequently, quality processing without the crack of a wafer and the chip (defect of the cutting section is attained. In addition, when the quality of the material strong against heat is good and applies ultraviolet radiation, the tape which exfoliates easily may tend to use adhesive tape 41.
[0047]
Next, how to decide the wafer core at the time of using the processing guide 40 and the direction of a cage hula using drawing 11 (a) and (b) is explained.
As shown in drawing 11 (a), when sticking the sliced wafer 10 on arbitrary locations, the rear face of a plinth 2 is recognized by the optical approach, and the core and sense of width of face of a plinth 2 are decided. This sense turns into cage hula sense. Next, the distance from the rear face of a plinth 2 to a plinth 2 and the edge of the wafer 10 of the opposite side is measured, and a wafer core is decided like the 1st operation gestalt.
[0048]
Or as shown in drawing 11 (b), the wafer 10 sliced on the basis of the processing guide 40 is stuck on adhesive tape 41. Under the present circumstances, a wafer core is searched for by the same approach as the 1st operation gestalt, and it sticks so that it may be in agreement with the core of the processing guide 40. While making it the rear face of notching 40b and a plinth 2 established in the processing guide 40 specifically become parallel, the rear face of a plinth 2 and the distance of guide notching 40b from which the core of a wafer 10 takes the lead in the processing guide 40 are found in this condition from the distance from the upper part of a wafer 10 to the rear face of a plinth 2, and a wafer 10 is stuck. By this, cutting on the basis of the processing guide 40 can be performed.
[0049]
At this time, it is good for the dedicated device which sticks the sliced wafer 10 with a sufficient precision to be in the processing guide 40. Moreover, you may decide by approach which explained the core and cage hula sense of a wafer 10 with the 1st operation gestalt by marking

of an ingot 1 (refer to drawing 4).
[0050]
The structure of the cutting table at the time of using the processing guide 40 is shown in drawing 12 .
A cutting field can use the table 20 of an opening like the 1st operation gestalt. At this time, the center section of a wafer 10 is adsorbed under vacuum, and is held. That is, the adsorption method by the vacuum is used as a means to fix the sliced semi-conductor substrate 10 to the table 20 for cutting. Under the present circumstances, as shown in drawing 13 (a), vacuum adsorption also of the processing guide 40 is carried out. That is, the adsorption method by the vacuum is used as a means to fix a frame 40 to the table 20 for cutting. Or as shown in drawing 13 (b), it fixes from the periphery side of the processing guide 40 by stay 50. That is, the member 50 suppressed on the table 20 for cutting from on a frame 40 is used as a means to fix a frame 40 to the table 20 for cutting. Or as shown in drawing 13 (c), you may fix with the magnet 51 formed in the top face of a table 20. That is, the magnet 51 which adsorbs a frame 40 may be used as a means to fix a frame 40 to the table 20 for cutting. When it fixes with a magnet 51, the processing guide 40 is produced with the ingredient by which a magnet is adsorbed.
[0051]
Moreover, as, and the table 20 which supports a cutting field at a point by using a pin 25 is used as shown in drawing 15 , or shown in drawing 16 , it is good for a cutting field to use the table 20 of a crevice 22. [using the table which supports a cutting field by the line by using the honeycomb material 24 like the 1st operation gestalt, as shown in drawing 14] It supposes that a wafer center section is adsorbed under vacuum and held also in these cases, and as drawing 13 (a), (b), and (c) explained further, the processing guide 40 is fixed with vacuum adsorption, stay 50, or a magnet 51.
[0052]
In addition, when the sliced wafer 10 is stuck on the basis of the processing guide 40, the processing guide 40 is set to a fixed location and the fixed sense to the table of cutting equipment.
[Brief Description of the Drawings]
[Drawing 1] (a) - (d) is a perspective view for explaining the processing procedure in the gestalt of the 1st operation.
[Drawing 2] (a) - (c) is a top view for explaining a logging process.
[Drawing 3] (a) and (b) are drawing for explaining the decision approach of a wafer core and the direction of a cage hula.
[Drawing 4] (a) and (b) are drawing for explaining the decision approach of a wafer core and the direction of a cage hula.
[Drawing 5] Drawing of longitudinal section showing the table for cutting.
[Drawing 6] Drawing of longitudinal section showing the table for cutting.
[Drawing 7] Drawing of longitudinal section showing the table for cutting.
[Drawing 8] Drawing of longitudinal section showing the table for cutting.
[Drawing 9] Drawing of longitudinal section showing the table for cutting.
[Drawing 10] (a) and (b) are drawing for explaining the manner of support of the wafer in the gestalt of the 2nd operation.
[Drawing 11] (a) and (b) are a top view for explaining the decision approach of a wafer core and the direction of a cage hula.
[Drawing 12] Drawing of longitudinal section showing the table for cutting.
[Drawing 13] (a), (b), and (c) are drawing of longitudinal section showing the supporting structure of a processing guide.
[Drawing 14] Drawing of longitudinal section showing the table for cutting.
[Drawing 15] Drawing of longitudinal section showing the table for cutting.
[Drawing 16] Drawing of longitudinal section showing the table for cutting.
[Description of Notations]
1 [-- Laser oscillation machine,] -- An ingot, 2 -- A susceptor seat, 3 -- A wire saw, 4 5 -- A scanner, 10 -- A wafer (semi-conductor substrate), 11 -- Wafer (semi-conductor substrate), 12 -- A wafer (semi-conductor substrate), 13a, 13b, 13c, 13d -- Wafer (semi-conductor substrate), 20 [-- A pin, 30 / -- A mark, 31 / -- A mark, 40 / -- A processing guide (frame), 40a / -- Opening, 41 / -- Adhesive tape, 50 / -- Stay, 51 / -- Magnet.] -- A table, 20a -- A back face, 24 -- Honeycomb material, 25

[Translation done.]